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Selected US specifications from IPC sub-class

D06M

(54) **Fabric conditioners**

(57) Fabric softening formulations contain polyoxyalkylene glycerol alkanoate as non-ionic softener in addition to water dispersible cationic softener. This enables the viscosity of the formulation to be reduced as well as the amount of quaternary ammonium halides used.

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FABRIC CONDITIONERS

This invention relates to compositions suitable for use in fabric conditioning also known as fabric softening.

Fabric softener formulations are usually aqueous based, contain a water dispersible cationic softener, a non-ionic surfactant and an electrolyte which enables the viscosity of the formulation to be controlled.

It has now been found that good fabric softening formulations may be formed by using a specific non-ionic softener without adversely affecting the fabric being softened or the softening process.

Accordingly, the present invention is an aqueous based fabric softening formulation comprising a water dispersible cationic softener, a non-ionic softener and optionally an electrolyte, characterised in that the non-ionic softener comprises polyoxyalkylene glycerol alkanoate.

The non-ionic polyoxyalkylene glycerol alkanoate used in the present invention has the formula:-



wherein R_1 , R_2 and R_3 are such that either each of R_1 and R_3 represent an acyl group containing 12 to 20 carbon atoms and R_2 represents an oxyalkylene group $-(C_nH_{2n}O)_xH$ wherein n is 2 or 3 and x is an integer from 1 to 200, or R_1 is an acyl group containing 12 to 20 carbon atoms and each of R_2 and R_3 represent an oxyalkylene

group $-(C_nH_{2n}O)_xH$ wherein n is 2 or 3 and x is an integer from 1 to 100.

In the polyoxyalkylene glycerol alkanoates of the formula (I), n is preferably 2, i.e. the oxyalkylene groups are preferably oxyethylene groups. The value of the alkoxy groups, x is preferably from 1 to 20, most preferably 7 to 12 in the case where $R_1 = R_3$ and the value of x is preferably from 1 to 10, most preferably from 2 to 6 in the case where $R_2 = R_3$.

Each R_1 group is preferably derived from a saturated higher fatty acid such as lauric, myristic, palmitic or stearic acids. Polyoxyethylene glycerol mono- and distearates whether used alone or as an admixture are most preferred.

In the fabric softening formulation the polyalkylene glycerol alkanoate is present in an amount from 5-60% w/w, preferably from 10-40% w/w based on the total surfactant content of the formulation.

The polyoxyalkylene glycerol alkanoates may be produced by any of the conventional procedures known in the art. For example, reaction of glycerol with the appropriate fatty acid to produce the glycerol fatty acid ester followed by reaction of this product with an alkylene oxide.

The fabric softening formulation may contain in addition other surfactants such as an alkyl fatty acid alkoxylate, an alkylalkoxylate or mixtures thereof. Specific examples of such other surfactants include alkyl fatty acid ethoxylates and alkyl ethoxylates respectively.

The non-ionic polyoxyalkylene glycerol alkanoate is suitably used in conjunction with conventional water-dispersible cationic softeners such as the quaternary ammonium halides or the imidazolinium halides.

Thus, according to a further embodiment the present invention is an aqueous based fabric softening formulation comprising:

- (a) a water-dispersible cationic softener selected from
 - (i) dihydrocarbyldialkylammonium salt of the formula:-

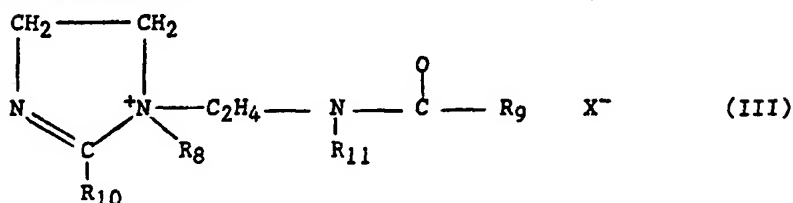


wherein R_4 and R_5 are the same or different C_{12} to C_{24} alkyl or alkenyl groups, which may optionally carry additional functional groups selected from -OH, -O-, -CONH and -COO- either as substituents or as part of the main alkyl or alkenyl chain,

R_6 and R_7 are the same or different C_1 - C_4 alkyl, hydroxyalkyl and polyoxyalkylene groups, and

X^- is an anion selected from a halide, methosulphate and ethosulphate and

(ii) an alkylimidazolium salt of the formula (III):



wherein R_8 is a C_1 - C_4 alkyl or hydroxyalkyl group, R_9 and R_{10} are the same or different alkyl or alkenyl groups containing from 8 to 25 carbon atoms, and R_{11} is hydrogen or a C_1 - C_4 alkyl group and X^- is an anion, selected from a halide, methosulphate or ethosulphate,

(b) a polyoxyalkylene glycerol alkanoate as defined above, and

(c) one or more alkoxylates selected from:

(i) an alkyl fatty acid alkoxylate of the formula:



wherein R_{12} is a C_{11} - C_{19} alkyl or alkenyl group,

n is an integer 2 or 3, and

m has a value from 1 to 6; and

(ii) an alkyl alkoxylate of the formula:



wherein n is an integer 2 or 3

p is an integer from 12-20, and

q has a value from 1 to 15; and optionally,

(d) an electrolyte.

Examples of these cationic softeners of formula (II) above include: dieicosyldimethyl ammonium chloride; didocosyldimethyl ammonium chloride; dioctadecyldimethyl ammonium chloride; 5 dioctadecyldimethyl ammonium methosulphate; ditetradecyldimethyl ammonium chloride and naturally occurring mixtures of above fatty groups, e.g. di(hydrogenated tallow) dimethyl ammonium chloride; di(hydrogenated tallow) dimethyl ammonium methosulphate; ditallow dimethyl ammonium chloride; and dioleyldimethyl ammonium chloride. 10 Di(hydrogenated tallow)dimethyl ammonium chloride or dioctadecyldimethyl ammonium chloride is preferred.

In a formulation containing the components (a), (b) and (c) above if the component (a) is represented by formula (II) each of R_4 and R_5 suitably represent a substituent in which more than 50%, 15 preferably more than 75% of the groups are C_{16} and/or C_{18} alkyl and/or alkenyl groups. More preferably, each of the substituent groups R_4 and R_5 represent a mixture of alkyl and alkenyl groups, namely from 50-90% C_{18} alkyl or alkenyl groups and from 10 to 50% C_{16} alkyl or alkenyl groups.

20 Thus, the substituents R_4 and R_5 are most preferably represented by ditallow groupings, and substituents R_6 and R_7 are preferably methyl groups and the anion is preferably a chloride.

Thus, the preferred component (a) of formula (II) is ditallowdimethyl ammonium chloride.

25 Examples of the imidazolinium salts of formula (III) above include 1-methyl-1-(tallowylamido-) ethyl -2-tallowyl- 4,5-dihydro imidazolinium methosulphate and 1-methyl-1-(palmitoylamido)ethyl -2-octadecyl-4,5- dihydro-imidazolinium methosulphate. Other useful imidazolinium materials are 2-heptadecyl-1-methyl-1- 30 (2-stearylamido)-ethyl-imidazolinium methosulphate and 2-lauryl-1-hydroxyethyl-1-oleyl-imidazolinium chloride. Such imidazolinium fabric softening components are described more fully in US Patent No. 4 127 489 and can be used in the formulations of the present invention.

35 The cationic quaternary salt components falling within (a)

above are commercially available materials under the following trade names or Registered Trade Marks: Arquad 2HT (ex AKZO); Noranium M2SH (ex CEKA); and the imidazolinium compounds falling within (a) are Rewoquat W7500H, Rewoquat W7500 and Rewoquat W3690 (all ex REWO),
 5 Casaquat 865 & 888 (ex Thomas Swan) and Blandofen CAZ-75 (ex GAF).

The formulations of the present invention may optionally include specific electrolytes to assist in controlling the viscosity of the product. The amount of electrolyte in the formulation is suitably from 0.01% to 0.5%, most preferably from about 0.02% to
 10 about 0.2%, measured as the anhydrous salt. Examples of electrolytes that may be used include lithium chloride, calcium chloride, magnesium chloride, aluminium chloride and mixtures thereof.

In the alkyl fatty acid alkoxylates of formula (IV) it is
 15 preferable to use the ethoxylates, i.e. compounds in which n is 2. The value of alkoxy groups, m, in the alkyl fatty acid alkoxylates is preferably from 1-3. The fatty acid used is preferably a tallow fatty acid, which is a mixture of 25% palmitic acid, 39% oleic acid, 19% stearic acid, 4.5% linoleic acid and 3% myristic acid. Such a
 20 fatty acid is sold commercially as T20 by Procter and Gamble.

As for the alkyl alkoxylates of formula (V), it is preferable to use an alkyl ethoxylate, i.e. n in formula (V) is 2. The value of the alkoxyl group, q, is preferably from 1 to 4.

When using a fabric conditioning formulation in which all the
 25 three components (a), (b) and (c) are normally present, the following weight percentages of each based on the total weight of (a), (b) and (c) are suitably used:-

- (a) 10 to 90%.
- (b) 5 to 60%
- 30 (c) 5 to 60%

Preferably (a), (b) and (c) are present in the following weight percentages of the total weight of (a), (b) and (c).

- (a) 25 to 80%
- (b) 10 to 40%
- 35 (c) 10 to 40%

More preferably, (a), (b) and (c) are present in the following weight percentages based on the total weight of (a), (b) and (c)

(a) 40 to 70%

(b) 10 to 30%

5 (c) 10 to 30%

Formulations according to the present invention if prepared as a preblend may be prepared by blending, e.g. by mixing (a), (b) and (c) at a temperature in the range 50 to 60°C.

10 The formulations according to the present invention, if prepared as a preblend, may be dispersed in water by mixing the components (a), (b) and (c) in water with moderate shearing at elevated temperature, for example, in the range 40 to 50°C.

The total amount of (a), (b) and (c) in the water is preferably from 2 to 10% by weight.

15 Thus as another aspect of the present invention, a fabric conditioner comprises a total of 2 to 10% by weight of (a), (b) and (c) in an aqueous dispersion.

Other components present in the fabric conditioner formulation may include a dye and a perfume.

20 Examples

1. Synthesis of Ethoxylated Glycerol Stearates

Glycerol esters of stearic acid may be synthesised by heating the appropriate number of moles of stearic acid with 1 mole of glycerol at 180-240°C until the calculated quantity of water
25 distils.

The ethoxylated glycerol stearates were prepared by reaction of the glycerol mono- or distearate in an autoclave with the requisite amount of ethylene oxide at a temperature of 140°C and a pressure of 4.5 bar according to standard procedures. (See for example,
30 Malkemus, J. Amer. Oil Chemists' Soc., 1956, 33, 571). Potassium hydroxide (0.15%) was used as the catalyst.

2. Softening Test

Softening Test 2.1

Test Solution

35 Ditalowdimethylammonium chloride (available as a 75% mixture

f th ammonium halide and 25% pr pan-2- 1) was heated at 50°C and mixed under low shear conditions with the ethoxylated glycerol monostearate.

5 A 5% (by total weight) dispersion was formed in water heated to 40°C, with moderate shearing and contained 2% by weight of ditallowdimethylammonium chloride and 3% by weight of ethoxylated glycerol monostearate (2x = 3 in formula (I)).

10 When cool, 4g of this 5% dispersion was further diluted with 996g of water to obtain a test solution which simulates a typical concentration of fabric conditioner existing in a washing machine in a washing machine rinse cycle.

Comparative Solution

15 A comparative solution was prepared by diluting 4g of 5% by weight in water dispersion of the ditallowdimethylammonium chloride in 996g of water.

The test solution and the comparative solution were used to soften test cloths.

20 Sixteen terry towel cloths were washed twice in a commercial heavy duty detergent powder (not containing softener) to remove any coating applied during manufacture. Eight of the cloths were soaked in the test solution and eight of the cloths were soaked in the comparative solution at a cloth/liquor ratio of 150g/1.5 litres for 10 minutes with gentle agitation using a glass rod. They were subsequently removed, tumble dried and divided into eight in order
25 that each of the softening panellists used the same sample.

Pair Comparison Tests

The softening test procedure entitled pair comparison tests was carried out using panels of eight persons.

30 Panel members were required to compare the softness of two cloths A and B (one being a test cloth, the other a comparison cloth) and rank them as follows:-

A is definitely softer than B	Score +2
A is possibly softer than B	Score +1
No difference	Score 0
35 A is possibly harsher than B	Scor -1

A is definitely harsher than B Score -2

Scores for each cloth were totalled, averaged and the 95% confidence limit calculated.

5 On a scale of -2 to +2, the test solution scored +0.42 in a panel test compared with -0.08 for the comparative solution, an improved softening performance.

Softening Test 2.2

10 Softening test 2.1 was repeated, but using a dispersion in water containing 4% by weight of the ditallowdimethylammonium chloride and 1% by weight of ethoxylated glycerol distearate (x = 10 in formula (I)). This composition was not significantly different in performance from the comparative solution in a panel test, although less ditallowdimethylammonium chloride was used.

15 The viscosity of this new formulation at 1 sec^{-1} was 724 millipascal sec compared with 566 millipascal sec for the comparative solution, showing a significant viscosity enhancement.

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Claims

1. An aqueous based fabric softening formulation comprising a water dispersible cationic softener, a non-ionic softener and optionally an electrolyte, characterised in that the non-ionic softener comprises a polyoxyalkylene glycerol alkanoate.
- 5 2. A fabric softening formulation according to claim 1 wherein the non-ionic polyoxyalkylene glycerol alkanoate has the formula:

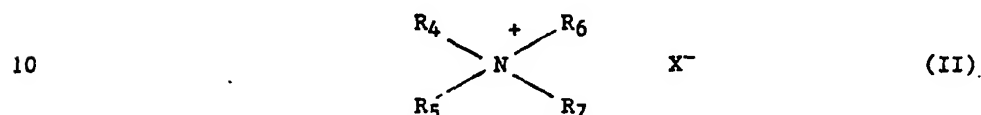


- wherein R_1 , R_2 and R_3 are such that either each of R_1 and R_3 represent an acyl group containing 12 to 20 carbon atoms and R_2 represents an oxyalkylene group $-(\text{C}_n\text{H}_{2n}\text{O})_x\text{H}$ wherein n is 2 or 3 and x is an integer from 1 to 200, or R_1 is an acyl group containing 12 to 20 carbon atoms and each of R_2 and R_3 represent an oxyalkylene group $-(\text{C}_n\text{H}_{2n}\text{O})_x\text{H}$ wherein n is 2 or 3 and x is an integer from 1 to 100.
- 20 3. A fabric softening formulation according to claim 1 or 2 wherein the oxyalkylene group is oxyethylene.
 4. A fabric softening formulation according to any one of the preceding claims wherein each R_1 group is derived from a saturated higher fatty acid.
 - 25 5. A fabric softening formulation according to any one of the

preceding claims wherein the polyoxyalkylene glycerol alkanoate is present in an amount from 5-60% w/w based on the total surfactant content of the formulation.

6. An aqueous based fabric softening formulation according to any one of the preceding claims, said formulation comprising (a) a water dispersible cationic softener selected from

(i) dihydrocarbyldialkylammonium salt of the formula:



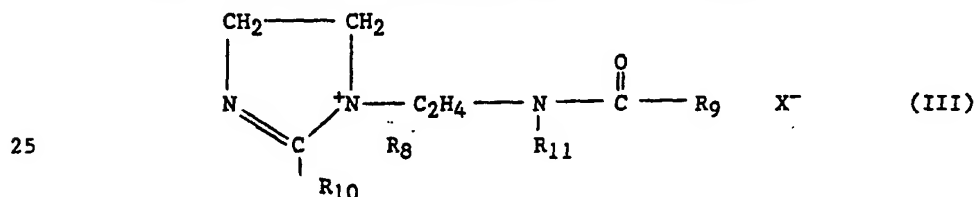
wherein R_4 and R_5 are the same or different C_{12} to C_{24} alkyl or alkenyl groups, which may optionally carry additional functional groups selected from -OH,

-O-, -CONH and -COO- either as substituents or as part of the main alkyl or alkenyl chain,

R_6 and R_7 are the same or different C_1 - C_4 alkyl, hydroxyalkyl and polyoxyalkylene groups, and

X^- is an anion selected from a halide, methosulphate and ethosulphate and

(ii) an alkylimidazolinium salt of the formula (III):

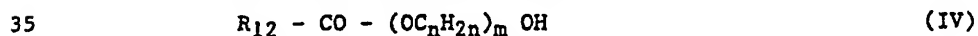


wherein R_8 is a C_1 - C_4 alkyl or hydroxyalkyl group, R_9 and R_{10} are the same or different alkyl or alkenyl groups containing from 8 to 25 carbon atoms, and R_{11} is hydrogen or a C_1 - C_4 alkyl group and X^- is an anion, selected from a halide, methosulphate or ethosulphate,

(b) a polyoxyalkylene glycerol alkanoate as defined above, and

(c) one or more alkoxylates selected from:

(i) an alkyl fatty acid alkoxylate of the formula:



wherein R_{12} is a C_{11} - C_{19} alkyl or alkenyl group,

n is an integer 2 or 3, and

m has a value from 1 to 6; and

(ii) an alkyl alkoxylate of the formula:

5 $C_p H_{2p+1} -(OC_n H_{2n})_q OH$ (v)

wherein n is an integer 2 or 3

p is an integer from 12-20, and

q has a value from 1 to 15; and optionally,

(d) an electrolyte.

10 7. A fabric softening formulation according to claim 6 wherein each of the substituents R_4 and R_5 in component (a) represent a substituent in which more than 50% of the groups are C_{16} and/or C_{18} alkyl and/or alkenyl groups.

8. A formulation according to claim 7 wherein each of the
15 substituents R_4 and R_5 represent a mixture of 50-90% C_{18} alkyl or alkenyl groups and 10-50% C_{16} alkyl or alkenyl groups.

9. A formulation according to any one of the preceding claims 6-8 wherein the components (a), (b) and (c) are present in the following ranges by weight based on the total weight of the three components:

20 (a) 10 to 90%

(b) 5 to 60%

(c) 5 to 60%

10. A formulation according to any one of the preceding claims 6-9 wherein the components (a), (b) and (c) are dispersed as a preblend
25 in water with moderate shearing at elevated temperature.

11. A formulation according to claim 10 wherein the total amount of the components (a), (b) and (c) in the water is from 2-10% by weight.

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